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This study explored individual and military risk factors for intimate partner aggression (IPA) perpetration among Navy personnel in their second year of service. We found some evidence that job stress was related to higher perpetration among men. Contrary to expectations, ship duty was related to lower perpetration rates, even though it involves more military operational stress and more frequent deployments than does shore duty. Premilitary alcohol problems were a stronger risk factor for men than for women, whereas premilitary patterns of aggressive behavior were a stronger risk factor for women. Recommendations for future research and public health interventions are discussed.

Research on intimate partner aggression (IPA) in the military has not been extensive and has focused largely on prevalence. Studies comparing military and civilian rates have yielded some evidence that IPA is more prevalent in active-duty than civilian populations (Heyman & Neidig, 1999; Merrill, Hervig, Milner, Newell, & Koss, 1998; Pan, Neidig, & O'Leary, 1994). Demographic differences such as the young average age in the military may explain much of the

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observed difference. However, even controlling for demographics, Heyman and Neidig (1999) noted somewhat higher rates of severe IPA among Army personnel compared with civilians. Furthermore, although most studies of IPA in military populations have relied on male samples and focused on husband-to-wife violence, like their male counterparts, active-duty women may have somewhat higher perpetration rates than civilians (Heyman & Neidig, 1999).

The finding of high IPA prevalence rates among military personnel raises the possibility that military contextual factors contribute to IPA risk. To date, little progress has been made in identifying such contextual factors. The few studies that have examined the impact of military operational stress or lifestyle factors on IPA prevalence have yielded inconsistent results. For example, there have been mixed findings as to whether combat deployment is a significant risk factor (McCarroll et al., 2000; Newby et al., 2005). In the present study, we explored associations between IPA perpetration and two elements of military context: male-dominated unit environment and level of military operational stress. In addition, we explored the possibility that individual risk factors for IPA perpetration might covary with these military contextual variables.

Male-Dominated Military Culture

It has been argued that the “warrior” identity is iconically and fundamentally hypermasculine (Mosher & Tomkins, 1988), and that traditional, male-dominated military units are characterized by a culture of hypermasculinity that functions to promote unit cohesion (Rosen, Knudson, & Fancher, 2003). In turn, this environment may selectively attract individuals with hypermasculine characteristics. Hypermasculinity is characterized by callous attitudes about sex, acceptance of violence as a means to an end, and a view of danger as exciting (Mosher & Tomkins, 1988). Both hypermasculine culture and individual hypermasculinity may be relevant in predicting IPA, because research has established positive associations between hypermasculine characteristics and likelihood of violence toward women (Parrott & Zeichner, 2003a). Although the integration of women into military units may undercut the dynamics of stereotypical hypermasculine military culture (Rosen, Bliese, Wright, & Gifford, 1999; Rosen et al., 2003), hypermasculinity likely remains an important aspect of military socialization. Furthermore, personnel high in hypermasculinity may gravitate toward or be disproportionately selected into occupations that are more male-dominated or hypermasculine within the Navy. Such occupations may also be more operationally stressful, involving ship or submarine duty.

Military Operational Stress

Stress has been noted in the research literature as a risk factor for IPA perpetration, particularly in conjunction with other risk factors (Hellmuth & McNulty, 2008;

Schumacher, Homish, Leonard, Quigley, & Kearns-Bodkin, 2008). In the Navy, operational stress from preparing for or performing the military mission is likely to be higher in male-dominated environments, because women are underrepresented shipboard and have historically been barred from submarine duty (Iskra, 2007). Furthermore, individual risk factors for IPA perpetration previously identified in the literature, such as negative childhood family environment, prior victimization/aggression, alcohol abuse, trait anger, and hostility toward the opposite sex (Langhinrichsen-Rohling, 2005; Parrott & Zeichner, 2003b; Stith & McMonigle, 2009) may be systematically overrepresented among personnel in higher-stress occupations. For example, some evidence shows that personnel with vulnerabilities such as family instability and low socioeconomic status have been more exposed to combat trauma during deployment (Beals et al., 2002; King, King, Foy, Keane, & Fairbank, 1999). Military selection bias in assigning personnel to combat roles may contribute to this pattern. Ultimately, both military selection and self-selection could lead to unequal prevalences of different types of individual risk factors across occupational groups. Although this has been demonstrated in relation to risk factors for traumatization (e.g., combat exposure), we are not aware of any research that has explored potential bias in the relative representation of individual risk factors across military occupational groups that might predict the perpetration of violence such as IPA.

Gender Equivalence of Risk Factors

Because few studies have previously explored the dynamics of IPA perpetration among military women, another important goal of this study was to evaluate the equivalence of results for male and female personnel. Some military factors may differentially impact women versus men. Operational stress, for instance, may not be as prevalent for women as it is for men because women are more often assigned to support rather than direct combat roles. Furthermore, being in a primarily male unit may have completely different effects on IPA risk for women than for men. In fact, there is evidence that women's IPA perpetration rates decrease in hypermasculine environments in which male aggression is more normative (Archer, 2000).

Hypergender (hypermasculinity and hyperfemininity) is another characteristic that may have a different relationship with IPA for women than for men. Whereas hypermasculinity has been associated with violence toward women, hyperfemininity, the female analog (defined as overvaluation of relationships with men and use of sex as a commodity to obtain power and influence), has been identified as a risk factor for sexual assault victimization (Maybach & Gold, 1994; McKelvie & Gold, 1994). However, whereas hyperfemininity has been found to be unrelated to positive aspects of feminine gender roles and assertiveness, it is associated with antisocial tendencies and psychopathology (McKelvie & Gold, 1994). This suggests that hyperfemininity represents a maladaptive and

extreme expression of female socialization, which also could be associated with aggression.

Current Study

We used longitudinal data from a large survey of Navy recruits to explore IPA prevalence rates in relation to both individual and military contextual risk factors. We expected that individual risk factors might be overrepresented within specific military occupational groups, and particularly in high-stress or male-dominated contexts. We further expected that IPA risk would be higher for those in high-stress jobs and in preponderantly male units. Finally, we assessed the equivalence of predictive models of IPA perpetration for men and women. Specifically, we expected that:

1. Persons high on individual risk factors for IPA perpetration, and in particular hypermasculinity, would be disproportionately recruited or self-selected into high-stress occupations.
2. Premilitary individual risk factors (i.e., prior perpetration, general aggression, prior victimization, negative family environment, hypermasculinity, hostility toward the opposite sex, anger, and heavy alcohol use) would each significantly predict IPA perpetration during the second year of military service.
3. In male-dominated environments, men would be more likely to perpetrate IPA, whereas women would be less likely to perpetrate.
4. Even after controlling for individual risk factors, personnel in high-stress occupational specialties would be more likely to perpetrate IPA than would personnel in low-stress occupational specialties.

METHOD

Data for this study were from the Naval Health Research Center Survey of Navy Recruits (Merrill, Newell, et al., 1998), conducted from June 1996 to June 1997 at the Recruit Training Command, Great Lakes, Illinois ($N = 11,195$). Approximately half of the participants in this study took part in a longitudinal follow-up over 2 years ($n = 5,498$). This report includes only personnel remaining on active duty throughout this time frame, who reported being married or cohabiting at the final follow-up, and who provided data regarding IPA perpetration during their second year of service ($n = 377$).

Participants

The study sample included 147 men and 230 women. Most were white (61%), with 16% black, 14% Hispanic, 5% Asian, and 4% other. The median income

reported for family of origin was \$25,000 to \$35,000, with 38% below and 45% above this level. At baseline the mean age was 20.11 years ($SD = 2.98$; 17–19 years = 58%, 20–29 years = 41%, 30 plus years = 1%). Most (88%) reported a high school education or less (GED or less = 6%, high school diploma = 82%, any advanced education = 12%). At baseline, 24% of this sample reported that they were married (17%) or cohabiting (7%). Just 14% had children under the age of 18. After two years of service, 83% were married, 17% cohabiting, and 38% percent reported children under age 18 years.

At follow-up, only 20 married/cohabiting participants were missing data regarding IPA perpetration. Using Navy personnel records, we estimated that an additional 799 longitudinal participants were married and on active duty at the end of 2 years but did not respond to the final survey. We explored the potential impact of combined study attrition and missing data on our analyses using baseline data. Men (75%) were substantially more likely than women (62%) to be nonrespondents. Also, nonrespondents (8%) were less likely than respondents (12%) to report education beyond high school. On the other hand, there were no differences in mean age, race/ethnicity, family income level, or baseline marital and parental status. Importantly, there were no significant differences in baseline prevalence of lifetime IPA perpetration.

Procedure

Recruits in gender-integrated units were surveyed in a classroom setting during their first week of basic training (response rates: men, 97%; women, 96%). A research assistant read a description of the study and the voluntary nature of participation. Those who agreed to participate signed an informed consent form describing the study, including procedures to ensure confidentiality. Identifying information for longitudinal follow-up was collected on tear-off sheets associated with randomly assigned study ID codes. Tear-off sheets were removed from participants' survey data and used to create a master key matching random ID numbers and identifiers. All identifying information was stored separately from study data in a locked facility at Northern Illinois University (NIU). No military personnel had access to the tear-off sheets or the master key. Follow-up surveys were mailed after 6, 12, and 24 months. Responses were merged with baseline survey results and archival information from personnel records to create a comprehensive dataset; personal identifiers were subsequently destroyed. By the 2-year follow-up, a number of the longitudinal participants (31%) could not be resurveyed because they had been discharged from naval service, accurate mailing addresses were unavailable, or they declined to participate. Of those who were available, 32% responded.

Measures

Background information. At baseline, participants were asked about their personal demographic characteristics, including age, race/ethnicity, education level, and marital and parental status. This section also asked questions regarding family background, such as income level of family of origin.

Parental Support Scale. In addition to family demographics, participants completed the Parental Support Scale (PSS; Fromuth, 1986). This measure includes a list of 22 statements representing constructive and destructive parenting styles. Participants indicate how much each statement reflects their own parents' behavior on a five-point scale (1 = *agree*; 5 = *disagree*). Summed scores can range from 22 to 110 (Cronbach's $\alpha = .88$), with higher values indicating more supportive parenting.

Prior victimization. To assess lifetime premilitary victimization histories, participants were asked whether they had ever been victims of eight different types of interpersonal violence (childhood physical abuse, childhood sexual abuse, sexual assault, IPA victimization, mugging, assault with a knife, assault with a gun, other physical assault). These questions employed a yes/no response format (e.g., "Before the age of 18, were you ever physically abused?"). Prior victimization was indexed by the total number of different types of victimization participants reported (KR-20 = .62).

Prior aggression. Premilitary general aggression was assessed using a set of items taken from two separate measures, the Trauma Symptom Inventory (Briere, 1995; violent fantasies, violent dreams, verbal aggression, fighting when angry, wanting to hit people, wanting to set fires) and a delinquent behavior questionnaire modified from a series of items used by Ageton (1983; damaging others' property, hitting/threatening to hit others, carrying concealed weapons). General aggression was indexed by the total number of these nine behaviors in which participants reported having previously engaged (KR-20 = .67).

Hypergender. At baseline, women were administered the Hyperfemininity Scale (HF; Murnen & Byrne, 1991), and men were administered the Hypermasculinity Scale (HM; Mosher & Sirkin, 1984). Each of these measures consists of a series of forced-choice item pairs, with scale scores representing the total number of hypergender response options chosen. The HF scale includes 26 items, with scores ranging from 0 to 26 (KR-20 = .66). The HM scale includes 29 items (range = 0 to 29; KR-20 = .74).

Hostility toward the opposite sex. The Hostility Toward Women (HTW) scale developed by Check (1984, 1988; Check, Elias, & Barton, 1988; Check, Perlman, & Malamuth, 1985) includes 30 true/false items. Responses indicative of hostility are summed for a maximum score of 30 ($KR-20 = .79$). The phrasing regarding gender in the HTW was reversed to assess Hostility Toward Men (HTM). The resulting 30-item measure had similarly high internal consistency ($KR-20 = .84$).

Trait anger. The Multidimensional Anger Inventory (MAI) was used at baseline to operationalize trait anger (Siegel, 1986). This measure includes 38 items assessing generally hostile attitudes and anger-eliciting situations, as well as the frequency, duration, magnitude, and method of expression of anger. Participants rate each item as to how accurately it describes them (1 = *completely un-descriptive*; 5 = *completely descriptive*). Total scores, computed by summing across responses, can range from 38 to 190. MAI total scores have previously shown adequate test-retest reliability ($r = .75$; Siegel, 1986), and the measure had good internal consistency for the current sample ($\alpha = .89$).

Alcohol dependence. To evaluate alcohol problems, at baseline participants completed the Michigan Alcoholism Screening Test (MAST; Selzer, 1971). This is a well-known and widely used measure of alcohol dependence. MAST scores are computed as a weighted sum of responses to 24 yes/no items. However, prior research suggests that two MAST items may increase false positives (Alexander & Mangelsdorff, 1994), and these two questions were excluded in computing MAST scores (range = 0 to 49; $\alpha = .74$).

Military context. Questions regarding two important aspects of military service were included in the follow-up survey. One assessed the relative gender composition of participants' current units (*all male, mostly male, about equal, mostly female*), and the other assessed current ship-versus-shore duty assignment. Ship/shore duty assignment is a marker for military operational level, with ship duty involving more time deployed and potentially more job stress.

Military job satisfaction. The follow-up survey included a brief five-item scale regarding military job satisfaction written for the Survey of Navy Recruits. These items explored general satisfaction, satisfaction with work assignment, satisfaction with working conditions, career satisfaction, and retention intentions (e.g., "I plan to reenlist in the Navy"). Responses were made on a five-point scale (1, *strongly disagree*, to 5, *strongly agree*) and were summed to form total scores (range = 5 to 25; $\alpha = .86$).

Social support. Follow-up surveys included six social support items written for the Survey of Navy Recruits. Each item asked about the number of people participants could count on for social support, focusing primarily on emotional support (e.g., “how many people could you count on to help you feel more relaxed when you were under pressure or tense?” or “how many people accepted you totally, including your worst and best points?”). Responses to these items were averaged to create a total social support score (range = 6 to 30; $\alpha = .95$).

Military occupational stress. Military occupation (i.e., enlisted rating) and pay grade were extracted from personnel records. Occupations were categorized into groups managed independently in staffing assignments within the time frame of the survey (Navy Personnel Command, 2000). These groups are recognizable occupational communities, although some of them are more distinct than others in terms of chain of command, geographic clustering, and subculture. Nine communities were represented among our participants: (1) Administration/Deck/Supply, (2) Aviation, (3) Cryptology/Electronic Warfare/Intelligence, (4) Engineering/Hull, (5) Medical, (6) Music, (7) Seabees, (8) Submarine/Nuclear, and (9) Technical. Additionally, some participants did not yet have a specific rating and were still listed as Recruit/Apprentice. An experimental strategy was used to identify occupations involving high operational stress. For each occupation, between 3 and 10 ($M = 4.67$) senior enlisted and officers with supervisory responsibility for the job rates represented among our participants estimated the relative level of five types of stress: exposure to physical danger, responsibility for others, long hours and overtime, frequent moves or deployments, and likelihood of witnessing injury to others (1, *not stressful*, to 4, *very stressful*). Estimates were first averaged across supervisors to create five subscale scores. Subscales scores were then averaged to create an overall job-stress index ($M = 13.40$; $SD = 2.20$; $\alpha = .86$).¹

Intimate partner aggression. The intimate partner version of the Conflict Tactics Scales (Straus, 1979) was used to estimate lifetime prevalence of IPA perpetration at baseline and perpetration within the past year at follow-up. Respondents were classified based on the highest level of IPA reported: none, verbal only (six items; e.g., insulted or swore at partner), mild physical (three items;

¹ To assess the validity of our job-stress index, we conducted a one-way analysis of variance by community. Because stress was estimated for specific jobs, we considered each job a case. Cases were then weighted by the proportion of survey participants with that job within its community. The main effect was significant, $F(8, 877) = 348.69$, $p < .001$, as were all pairwise, post hoc comparisons except Aviation versus Submarine and Technical, as well as Medical versus Seabees (rank-ordered weighted means: Seabees, 15.70; Medical, 15.67; Engineering/Hull, 15.32; Submarine/Nuclear, 13.97; Aviation, 13.69; Technical, 12.97; Administration/Deck/Supply, 12.17; Cryptology/Electronic Warfare/Intelligence, 11.08; and Music, 8.67).

e.g., pushed or slapped), or severe physical (six items; e.g., kicked or punched with fist).

Data Analyses

Analyses were conducted using SPSS (PASW Release 17.0.3) and Amos 17.0.2 (Arbuckle, 2006; SPSS Inc., 2009) software. Although analyses included only participants with complete data regarding IPA in their second year of service, there were some missing data for predictive risk factors (1% to 8%). Because of this, *ns* varied in preliminary analyses and are reported individually. In multivariate analysis, we used full-information maximum-likelihood methods to accommodate missing data (Arbuckle & Wothke, 1995). More detailed information regarding data analysis strategies is described below.

RESULTS

In this sample of married or cohabiting Navy personnel, 15% of men and 32% of women reported some level of physical aggression toward their partner during the second year of service. Another 60% of men and 51% of women reported verbal aggression only. Women reported more perpetration of physical IPA (mild only, 18%; severe, 14%) than did men (mild only, 10%; severe, 5%). IPA was not significantly associated with age, years of education, family of origin income level, number of children, marital status (married/cohabiting), or race/ethnicity (black, Hispanic, Asian, white, other).

Risk Factors for Second-Year Perpetration

At baseline, women reported more lifetime IPA perpetration and more victimization than did men (Table 1). Men reported marginally more generalized aggression ($p < .08$). At follow-up, compared with men, women on average were in a lower pay grade, had less stressful occupations, and were far less often on ship duty (28% vs. 72%). Interestingly, women judged the female representation in their units as somewhat lower than did men (Table 1).

To assess hypothesis 1, we explored whether persons high in baseline risk factors might be overrepresented in specific military communities or high-stress or male-dominated occupations. In our current sample, not all occupational communities were well represented; therefore, we only considered Administration/Deck/Supply (women, 20%; men, 16%), Aviation (women, 17%; men, 24%), Engineering/Hull (women, 10%; men, 20%), Medical (women, 17%; men, 7%), and Technical (women, 14%; men, 19%). We found no significant differences in the prevalence of baseline risk factors for these occupational communities within our sample. There also were no reliable differences in premilitary

TABLE 1
Descriptive Statistics and Correlations With Second-Year Intimate Partner Aggression

Risk Factors	M (SD)		Correlation	
	Women	Men ^a	Women	Men
Baseline				
Lifetime IPA level	1.44 (0.98)	0.94 (0.81)***	.30***	.27**
General aggression	2.21 (1.84)	2.60 (2.11)	.35***	.12
Victimization	1.42 (1.61)	1.07 (1.39)*	.20**	.13
Parental support	80.04 (18.20)	83.31 (14.43)	-.11	-.12
Hypergender ^b	6.69 (3.40)	8.80 (5.08)	.11	.12
Hostility ^b	9.97 (5.67)	8.03 (4.79)	.22**	.14
Anger	102.30 (19.42)	98.33 (19.10)	.22**	-.05
Alcohol	2.67 (4.50)	2.54 (2.95)	.08	.24**
Follow-up				
Pay grade	4.17 (0.75)	4.53 (0.67)***	-.12	-.20*
Ship duty	28%	72%***	.05	-.21*
Female representation	1.46 (0.67)	1.79 (0.70)***	-.07	.16
Social support	3.19 (2.13)	3.62 (2.53)	-.18**	-.14
Job satisfaction	2.89 (1.00)	2.94 (1.08)	-.03	-.19*
Job stress	13.11 (2.28)	13.83 (2.01)**	.04	.16

Notes. ^aAsterisks indicate significant mean differences by comparison with women. ^bMeasures for these constructs, although designed to be comparable, were not identical for men and women; therefore, mean differences were not tested. The correlation of job stress with second-year IPA was marginally significant for men ($p = .05$). Women: $n = 212$ – 230 ; men: $n = 126$ – 147 .

* $p < .05$. ** $p < .01$. *** $p < .001$.

risk factors by representation of women in the work group. Women who were currently on ship duty did report more baseline victimization ($r = .23, p < .001$) and general aggression ($r = .20, p < .01$). Also, men in more stressful job ratings reported more hostility toward women at baseline ($r = .19, p < .05$).²

² To assess whether comparisons between military community or job stress and baseline risk factors may have had low statistical power due to sample size, we reanalyzed them including all participants with any relevant baseline data (women, $n = 1,758$ – $1,907$; men, $n = 1,787$ – $2,146$; comparisons by community excluded Music, $n = 6$, and other). We still found few differences. Women in Administration did report more hyperfemininity than did women in Engineering and more hostility than women in Aviation. Men in Aviation reported more hypermasculinity than did medical corpsmen and more drinking problems than men in Medical, Administrative, or Technical ratings. Finally, men in Technical ratings expressed more hostility than did men in Administration. Differences were small, accounting for $< 1\%$ of the variance in baseline risk factors. Even in this sample, there were no significant correlations with job stress. We further correlated baseline risk factors with ship/shore status and unit female representation for all participants with follow-up survey data regardless of relationship status (women, $n = 581$ – 619 ; men, $n = 472$ – 549). We found one significant correlation: as for the study sample, women reporting premilitary victimization were slightly overrepresented on ship duty ($r = .08, p < .05$).

Next we examined whether there were differential prevalence rates of IPA perpetration at follow-up by military occupational community. Although the overall test for differences across groups was significant for both men, $F(4, 123) = 3.87, p < .01$, and women, $F(4, 174) = 3.07, p < .05$, in post hoc tests, no individual group comparisons reached significance for men. Among women, in the only significant comparison, those in Engineering were more likely than those in Aviation to report IPA perpetration (46% vs. 21%, $p < .05$).

To provide an initial test of hypothesis 2, correlations between follow-up IPA perpetration and each risk factor are shown separately for men and women in Table 1. Baseline IPA perpetration level was a risk factor for men and women. Beyond this, significant correlates for men and women were different. General aggression, victimization, hostility, and anger were significant for women only. Alcohol problems were significant for men only. Direct comparisons (t tests comparing figures normalized using Fisher's r -to- z transformation) identified significant gender differences in effect size for both general aggression and anger ($p < .05$). Unexpectedly, ship duty appeared to be a protective factor for men, whereas it was unrelated to second-year IPA perpetration for women; a direct comparison of effect size for men versus women was significant ($p < .05$). Social support was a protective factor for women, as were higher pay grade and job satisfaction for men. Being in a higher-stress military occupational specialty also was a marginally significant risk factor for men ($p = .05$). However, gender differences in the magnitudes of these effects were not significant. Finally, in conflict with hypothesis 3, female representation within the unit was not significantly correlated with IPA for men or women.

Multivariate Analysis

Because the results of bivariate analyses indicated that significant risk factors might be moderated by gender, we conducted multigroup linear regression analysis using Amos. This analysis strategy allowed us to explore the unique relevance of each risk factor in predicting IPA and to examine their relative significance for male and female personnel. All eight premilitary and six military risk factors were included as predictors. Preliminary analyses included two-way interactions pairing military occupational stress and unit female representation with each of the eight premilitary risk factors. However, none of these interactions contributed significantly to prediction, and they were dropped from the analysis.

In an initial unconstrained model, only three variables made significant contributions for women (Table 2); these were baseline reports of lifetime IPA perpetration, general aggression, and current social support. Among men, four variables were significant: baseline IPA level, baseline alcohol problems, current shore (versus ship) duty status, and occupational stress ratings. According to hypothesis 4, occupational stress (i.e., ship duty and higher-stress ratings) should

TABLE 2
Significant Results From Multi-Group Regression Analysis of Intimate Partner
Aggression Risk

<i>Risk factor</i>	<i>Unconstrained Model</i>		<i>Parsimonious Model</i>	
	<i>Women</i> ($R^2 = .21$)	<i>Men</i> ($R^2 = .24$)	<i>Women</i> ($R^2 = .20$)	<i>Men</i> ($R^2 = .18$)
Baseline				
Lifetime IPA level	0.18**	0.15*	0.16***	0.16***
General aggression	0.30***		0.33***	
Victimization				
Parental support				
Hypergender				
Hostility				
Anger				
Alcohol		0.19*		0.19*
Follow-up				
Pay grade				
Ship duty		-0.15*	-0.10*	-0.10*
Unit female representation				
Social support	-0.13*			
Job satisfaction				
Job stress		0.13*		

Notes. Only significant coefficients are listed. Women: n , 230; men: n , 147. Critical ratio tests indicated only two moderating effects of gender ($p < .01$) for general aggression and alcohol problems. In the parsimonious model, all other paths are held constant across men and women.

* $p < .05$. ** $p < .01$. *** $p < .001$.

be a significant predictor of IPA perpetration. Although both variables were significant for men, neither was a significant predictor for women. Moreover, as in the bivariate results, the effect for type of duty was the reverse of what we had hypothesized. Men on shore duty reported higher rates of IPA perpetration than did men on ship duty.

To test whether the magnitude of the effects of specific predictors varied by gender, we computed critical ratios (z statistics) comparing parameter estimates. Gender moderated the effects of premilitary general aggression (critical ratio, $z = -2.62$, $p < .01$) and alcohol problems ($z = 2.77$, $p < .01$). A parsimonious model, in which the effects of all predictors except these two were constrained to be equivalent for men and women, fit as well as the original unconstrained model, $\chi^2_{\text{difference}}(12) = 9.82$, $p = .63$. In the parsimonious model, there were three significant effects for men and three for women (Table 2). Premilitary IPA perpetration and current shore duty were significant risk factors for both groups. Premilitary alcohol problems also were significant for men, whereas premilitary general aggression was predictive for women.

DISCUSSION

This study explored individual and military risk factors for IPA among Navy personnel and evaluated the potential moderating effects of gender. We found very little evidence for systematic differences in IPA perpetration by military occupational community. For women, there was a somewhat higher prevalence of second-year perpetration in the Engineering community compared with Aviation. Although statistically significant, it would be important to verify whether this isolated difference for women is generalizable. There were no significant differences across occupational communities for men.

To test our first research hypothesis, we explored whether individual risk factors such as hypergender, hostility toward the opposite sex, trait anger, and general aggression might be overrepresented in specific military communities, especially high-stress occupational specialties. We found little support for this. There were no differences in baseline risk factors by occupational community, and no differences among units with higher versus lower female representation. Men high in hostility toward women were somewhat more likely to be in high-stress occupational specialties, and women with a premilitary history of IPA perpetration and aggression were more likely to be on ship duty. However, neither hostility toward women nor assignment to ship duty were ultimately risk factors for IPA perpetration, ruling out possible mediating relationships.

Our second hypothesis was that a number of premilitary individual characteristics would predict IPA during Navy service. We found some evidence to support this for most of the risk factors we considered, with a few notable exceptions. Parental support and hypergender were not significantly predictive of IPA in any of our analyses. This may partially be an issue of statistical power. The effects of distal risk factors such as parental support may be fairly small and difficult to verify statistically, although they may be reliable. It is, of course, possible that these variables do not have the hypothesized influence on IPA risk that we expected to find. Hypergender in particular and masculine role identity more generally may be complex and culturally evolving constructs, making it difficult to define how they may be related to IPA perpetration. For example, in a recent study of U.S. Army recruits over the course of basic training (Hendrix, 2006), there was a trend for hypermasculinity to increase from baseline to follow-up, while attitudes promoting violence toward women significantly decreased. This was despite the fact that hypermasculinity was positively correlated with attitudes promoting violence overall.

Contrary to our third hypothesis, we found no evidence that unit gender composition was predictive of IPA for either men or women. We had expected that male-dominated environments would be a risk factor for IPA perpetration at least among men. Optimistically, this null result may be a sign that women

are becoming more normatively integrated into the force and that their relative representation is not as consequential now as it may have been in the past. However, our lack of significant results may also be an artifact of the way this variable was operationalized. If self-reports regarding unit gender composition are inaccurate, stronger associations might be observed with objective information from military personnel records. It is also possible that self-reports of unit representation were vulnerable to response bias (e.g., men systematically overestimated female representation while women underestimated it). We did find that women reported less female representation overall than did men, although this is unlikely to be factual. Women are probably more likely to be assigned to units with other women than are men. However, women may be more consciously aware of their minority status and may therefore provide more accurate reports.

Several risk factors were significant predictors of IPA perpetration either for men or women only. For instance, higher levels of premilitary general aggression and lower current social support were associated with IPA perpetration for women. A direct test of gender differences in the size of these effects was significant only in the case of premilitary aggression. Conversely, three other risk factors were significant predictors of IPA for men only. The most notable of these was premilitary alcohol dependence, which showed significant moderation by gender in multivariate analyses. Alcohol use has been noted in both civilian and military research literatures as an important risk factor for IPA perpetration (Fonseca et al., 2006; Hurlbert & Whittaker, 1991; Jensen, Lewis, & Xenakis, 1986; Langhinrichsen-Rohling, 2005; Stith & McMonigle, 2009). It also has been associated with the severity of IPA, including the likelihood of injury and even homicide (McCarroll, Fan, & Bell, 2009; Pan et al., 1994; Rosen, Parmley, Knudson, & Fancher, 2002; Stith & McMonigle, 2009). In a different sample of Navy recruits, alcohol problems were related to premilitary IPA perpetration for both men and women (Merrill, Crouch, Thomsen, & Guimond, 2004; Merrill, Hervig, & Milner, 1996; White, Merrill, & Koss, 2001). However, among substantiated cases in the military, alcohol use has been more commonly found among male than female perpetrators (McCarroll et al., 2009). Future research should continue to explore the role of alcohol in IPA perpetration, and the potential moderating effects of gender on this relationship.

Partially supporting hypothesis 4, multivariate analysis revealed a significant association between occupational stress and IPA perpetration, albeit only for men. Although this effect was not significant for women, gender was not a significant moderator. Overall, men were in somewhat more stressful occupations than were women, which may make it a more salient risk factor among them. This is unlikely, though, because mean differences were small and overall variability was slightly greater for women. Future research should further explore the most relevant dimensions of job stress for men and women in relation to IPA perpetration.

Finally, in direct contradiction to hypothesis 4, men on shore duty more often reported IPA perpetration than did men on ship duty, despite the fact that ship assignments are likely to involve more deployment and operational stress. Although there were significant gender differences in the size of this effect bivarately, gender was not a significant moderator in multivariate analysis. Here it is possible that ship/shore status was somewhat confounded with an overrepresentation of women with a history of IPA perpetration and general aggression among the group on ship duty, as well as the fact that ship duty was less common for women. Controlling for these baseline differences, we were able to fit a multivariate solution for both men and women that included ship duty as a protective factor. This effect is likely related to opportunity. That is, because personnel are typically away from their spouse or cohabiting partner while on ship duty, they may be less likely to engage in IPA simply because they are not spending as much time together.

Strengths and Limitations

Two important strengths of this study are that it was longitudinal and that it included men and women. Given the underrepresentation of women in the service, evaluating gender differences has posed a challenge in past research. A limitation was the substantial study attrition. Analysis of the impact of missing data on our results suggested that compared with women, men were underrepresented at follow-up. However, persons with a history of IPA did not appear to be underrepresented. Another limitation was our reliance on self-report data, which are vulnerable to reporting biases and dependent on the reliability of participants' recollections.

It was difficult to parse the effects of different military contextual factors on outcomes because these factors tend to be substantially interrelated. For example, individuals assigned to ships or submarines are apt to be surrounded by men and exposed to higher levels of operational stress, making it difficult to tease apart the effects of each factor. It is possible that more direct measures of operational stress, male-dominated, or hypermasculine environments, and subcultural differences in norms and standards across military occupational communities might help to clarify these relationships and produce stronger evidence of associations between military context and IPA. For example, more detailed inquiries about unit gender composition, one's personal level of job stress, and one's perceptions of unit norms might reveal stronger effects. However, the fact that we found some trends opposite to those we had originally hypothesized suggests that this research area is fairly complex. Given the seriousness of IPA and the challenges in collecting objective data, the present study makes an important contribution.

CONCLUSION

The results of this study are important as much for what was not significant as for what was. In relation to recruitment policy and procedure, as well as targeted prevention programs, we found very little evidence that IPA prevalence systematically varied by military occupational community or that preexisting individual risk factors for IPA were overrepresented in male-dominated units or high-stress occupational specialties. Among men, there was some indication that job stress might increase the risk of IPA. Conversely, being in an occupation with frequent deployments may lower the risk, probably by virtue of reducing the window of opportunity for IPA perpetration. Here it should be noted that although Navy ships are frequently deployed, they do not always deploy for combat operations. Ships routinely participate in exercises, and they also deploy in humanitarian efforts. In fact, these would have been the only deployments participants experienced during the time frame of the present study. Thus, the level of operational stress our participants experienced was likely lower than it would have been during a time of war or in some other military services. Observed associations between operational stress and IPA might be different in those contexts. Future research should explore this possibility.

Our results also suggest that future research on hypermasculinity as a risk factor for IPA perpetration should explore the impact of change in this personality characteristic over time. Research may also need to look beyond hypergender, to role identity and self-efficacy more broadly. For example, in our results, two hallmarks of successful maturation and adjustment into military life (i.e., higher pay grade and job satisfaction) were negatively correlated with IPA perpetration among men in our sample. Successful acculturation in military service further involves the development of other positive individual characteristics (e.g., leadership ability, responsibility) that may be protective. Finally, given our null results, the relative importance of other personality characteristics in relation to hypermasculinity should be considered. Recent research on personality and relationship violence points out that a diverse range of personality profiles may present a risk for IPA perpetration (Gibbons, Collins, & Reid, 2011).

The potential for psychological and physical injury, including homicide, as well as other long-term health consequences from IPA, creates an important public health mandate for prevention (Bonomi, Anderson, Rivara, & Thompson, 2007; Karch, Dahlberg, & Patel, 2010). Campbell, Baty, Laughon, and Woods (2009) highlighted the importance of primary prevention programs targeting young populations, as well as efforts to promote broader cultural change in attitudes accepting of IPA. The military requires personnel to attend trainings on topics such as the prevention of sexual harassment, suicide, and substance abuse (Chief of Naval Operations, 2006; 2010). Although intensive multisession programs are often most effective in achieving behavioral change (Anderson & Whiston, 2005;

Botvin, Griffin, Diaz, & Ifill-Williams, 2001; Davis & Gidycz, 2000; Stice & Shaw, 2004; White & Pitts, 1998), military units typically are unable to allocate extensive time to all of these types of programs. Despite this, many of the kinds of skills that might help prevent IPA—for example, social skills, coping strategies, and conflict resolution tactics—may also help to prevent other types of behavioral and emotional problems as well (Campbell et al., 2009). Given the extant evidence of the importance of alcohol use as a risk factor for IPA perpetration (Leonard, 2005), for example, an increased focus on reducing cultural acceptance of excessive alcohol use would likely reduce the prevalence and severity of IPA. Ultimately, an integrated approach in which interventions target risk factors that are associated with multiple negative outcomes is likely to be both efficient and effective.

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